Jokebox: Coordinating Shared Encounters in Public Spaces

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ABSTRACT

Eye contact is crucial to shared encounters in public spaces. However, most urban technologies that aim to foster social interaction tend to rely on screens, directing a significant proportion of the users' attention towards the device rather than to those with whom the encounter is shared. We present the design and evaluation of the Jokebox, a lightweight technology that requires two passers-by to coordinate actions to hear a joke. In three in the wild studies at different locations we found that our design supported *micro-level coordination* in a consistent manner: by encouraging people to make eye contact and by using audible jokes, users engaged in interactions that often led to further conversation and laughter. We describe how opportunities for *macro-level coordination* were key to the success of the installation, but varied by context. Finally, we present design implications for considering both the micro and macro levels of social coordination.

Author Keywords

Public display; coordination; audio interface; in the wild

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

INTRODUCTION

Novel interactive devices are increasingly populating the urban landscape, typically with the aim of increasing efficiency and productivity through processes automation [5], but often reducing opportunities to interact with others. For example, in finding our way around the city using a navigation system we may not ask strangers for directions, or by using a flight check-in kiosk we are unlikely to engage in small talk with the counter assistant. When focused on screens and devices that deliver visual content, we also lose the opportunity to make eye contact with others, a behaviour known to be crucial in the organisation of shared encounters [2, 11].

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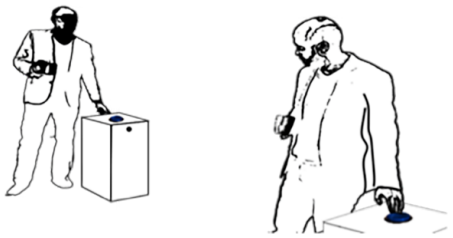

Figure 1. Two passers-by interacting with the Jokebox.

Face-to-face social interaction is associated with the cohesion of communities and the development of social capital [30]. At an individual level, interacting with others increases happiness and wellbeing [15]. Encounters that include humour and conversation can support psychological and physiological health [32, 8, 18]. This suggests that such social interactions should be encouraged.

However, facilitating social interaction in public spaces is hard to achieve [8, 22, 34, 11, 27, 18]. This is in part due to the fact that city dwellers often adopt a "blasé attitude" [34] or civil inattention [11] to separate themselves from the plethora of stimuli available in cities [22]. Strangers typically glance at each other and then look away demonstrating that they are aware of each others' presence, but do not wish to interact. These rules of non-interaction seem to be accentuated when we share constrained spaces [22, 11] or a routine with a stranger. Milgram [22] coined the term "familiar stranger", which had previously been discussed by Jacobs [16] to refer to those people who we frequently encounter (e.g. at the bus stop every morning) but never interact with. He also noted that there are exceptions to these rules of non-interaction: if we come across familiar strangers outside the everyday routine (e.g. while away on holiday) or in the presence of a highly unexpected event that serves as an "ice breaker".

A number of researchers have investigated how urban technology can act as an "ice breaker" facilitating shared encounters [37] in public spaces [9, 35, 19]. A prevailing approach has been to deploy interactive displays and

screens [9] delivering a wide range of visual contents [1, 4, 21, 33, 35, 36]. Many urban technologies require interaction by one person (or a group) to play a game (e.g. [19, 26]). They are often costly and hard to deploy (particularly in the case of media facades and augmented furniture), needing power and connection to the internet, which makes it difficult to easily deploy them at different locations. Typically, their content offers limited ways to elicit "synchronous social interactivity", such as face-to-face encounters [36]. Moreover, their interfaces tend to rely on interaction with visual information, which means that a significant proportion of the users' attention must be directed towards the device rather than to those with whom the encounter is shared. Some researchers have begun to explore how audio [19, 28] may promote social interactions in public spaces, but the use of audio to mediate synchronised cooperation between pairs of people remains largely unexplored [17].

Sharing a social encounter can often lead to a positive experience [8, 18], especially if it is brought about by an unexpected [22] or wondrous [28] event. However, given the sophisticated strategies that people use to *not* interact with others, it is important that interaction with any intervention is discretional [27]. How can urban interfaces enable eye contact and lead to shared encounters, while at the same time protecting people's personal space and therefore easing social apprehension? To address this question we propose the Jokebox, a novel lightweight technology that can attract two passers-by to look at each other and coordinate a sequence of actions in order to hear a joke.

We followed a qualitative approach to evaluate the Jokebox in an in-the-wild-study [31] at three different locations in Mexico: a bus stop, a park, and a shopping centre. Our results demonstrate that designing the Jokebox to encourage *micro-level coordination* facilitated a wide range of shared encounters that were quite consistent in their structure. By encouraging people to make eye contact and by using audio rather than having the content appear on a screen the system engaged them in a process of face-to-face interaction that often led to further conversation and laughter. We also found how opportunities for *macro-level coordination* were crucial to the success of the installation, but varied widely. Firstly, the context in which the Jokebox was situated significantly influenced how well this kind of sequencing worked; and secondly we observed how strangers championed interactions by guiding and encouraging others to engage with the Jokebox, and how returning users and local characters appropriated it for their own purposes. Our contributions inform the design and deployment of novel interfaces that aim to support shared encounters in public places.

BACKGROUND

One of the main characteristics of a city is its ability to create opportunities for encounters among strangers [16]. This has long inspired researchers and artists to design and deploy urban interfaces aimed at encouraging such encounters and ultimately facilitating community connectedness [9, 21, 28, 35].

A prevailing approach for urban technologies has been to deploy interactive displays and media facades that deliver visual information. These studies highlight a number of contextual factors that influence how people organise their interactions with and around the display. We characterise these as the macro-level coordination of behaviour to distinguish them from the micro-level coordination of joint actions with the interface itself. For example, Brignull and Rogers [4] found that social activity around the device could create a 'honeypot effect', drawing attention to it and encouraging others to engage. Fischer and Hornecker [9] suggested that physical features such as walls and pillars can provide 'comfort spaces', where people can see the display but are protected from having to join in the interaction. The placement of a technology intervention can also have an impact on how people interact with it, but social context can be more important that physical location [1]. O'Hara et al. [26] observed that an unfamiliar audience can discourage interactions and create a sense of social inhibition for some people, although "comperes" [26] and "emergent champions" [1] may help legitimise participation by members of the public. In contrast, for "local characters" familiarity with the place and situation may promote interactions by reducing social apprehension [26]. Other researchers have found that people may be willing to engage with a novel device once they have learnt how to do it. This can occur either by cooperative interaction or by first observing others and then attempting to interact, often leading to "chains of interaction" [29]. Furthermore, it has been argued that passers-by tend to find technology that has been deployed in public spaces interesting, which sometimes can enable social interaction [21, 29].

Studies of micro-level coordination with screen-based technologies have highlighted some of the challenges of interacting together. Peltonen et al. [29] report that most people who participated with their CityWall application worked in parallel rather than coordinating, and sometimes came into conflict because of a lack of awareness of others' activity. However, users also playfully appropriated the application, for example, throwing images at each other, creating an impromptu game of Pong. Marshall et al. [20] describe how strangers would often come into conflict while trying to simultaneously use a tabletop interface designed to be used by a coherent group. Hinrichs and Carpendale [13] report how people learned how to use a public tabletop interface through mentoring and demonstration.

A different approach to interactive screens has been to deploy augmented artefacts, from digitally enhanced furniture [25] to "objects of wonderment" [28]. More recently, researchers who deployed a playful intervention based on a network of bespoke trees and birds suggested that recruiting and incentivising people to "check in" together in public

spaces encouraged shared encounters and community cohesion [19].

The potential for using sound as an interaction output to facilitate social interactions in public has rarely been explored. In contrast to a visual display, people cannot turn away from a sound and are often drawn to its origin [17]. Furthermore, while most urban technologies just require one person to trigger an interaction, fewer designs have explored how to create shared encounters by requiring two people to act in tandem or by facilitating eye contact. How can novel interfaces, which are broadly accessible to anybody, engage passers-by to do something together in public without being self-conscious? In the next section we describe the design and implementation of the Jokebox, a prototype aimed to encourage eye contact and foster shared encounters in public spaces.

THE JOKEBOX

The Jokebox is a simple technology prototype aimed to attract passers-by and provide an opportunity for them to engage with both the installation and each other. Based on Ellis et al.'s [7] CSCW taxonomy, the Jokebox enables a synchronous face-to-face interaction, where both input and output are situated at the same place and time. The design rationale is informed by the literature review, which identifies that:

- A prevailing approach to urban technologies has been to design large displays for individual use that deliver visual content, which often prevents people from making eye contact [1, 4, 9, 21, 26, 29, 33, 35, 36]. We therefore chose to design (i) a tangible physical affordance that does not include a screen, (ii) an audio instruction to draw in passers-by, which requires two people to coordinate their actions by pressing two buttons at the same time; and (iii) a blinking light to attract attention and help with the coordination.
- The use of audio, which is a shared media and can easily attract people, has been largely unexplored [17]. Hence we included (iv) an audio instruction and a short spoken joke to encourage people to listen together, look at each other, and maybe even laugh or talk.
- Public displays and augmented furniture are often costly and require Internet connection and/or electricity [1, 4, 9]. We instead designed a lightweight and portable installation that can be easily deployed at different outdoor locations.
- While in public space, people employ sophisticated strategies to avoid interacting with others [8, 22, 34, 11, 18, 25] and technology should not cause social awkwardness [27]. We therefore designed the Jokebox to be non intrusive and protect people's personal spaces. The installation comprises two wooden boxes (1 meter high) with arcade buttons at the top and embedded speakers. Both boxes can be paired within a distance of 2 to 5 meters. However, an unexpected event may encourage people to overcome the rule of non-interaction [22]. Therefore the Jokebox uses unusual content such as jokes to foster social encounters.

More specifically, the Jokebox was designed to attract passers-by and incentivise them to coordinate actions. Each box can detect people nearby and invites them to interact by playing an audio file with the instructions*: "If you want to hear a joke, press both buttons at the same time"*. Once the boxes have played the instructions, they go into a playing mode. In this mode, two people have a three seconds window of time to press both buttons at the same time; thus they have to coordinate explicitly. Each button emits a blinking light pattern to indicate that the play session is on going; the blinking pattern increases its speed within the last 10 seconds to indicate the time window is almost over. The boxes play a joke when being pressed synchronously. Otherwise an error audio file is triggered. Moreover, the device was designed to make it clear *what* users should do with it, but *why* they should use it, who had created it, and why it was installed in a particular context was ambiguous [10] and left to their own interpretation.

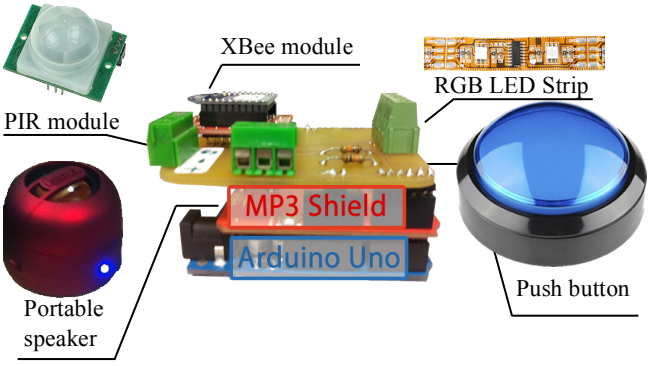

Figure 2. Technical implementation of the Jokebox.

Implementation

The Jokebox was implemented using a master-slave communication (see figure 2). The master box (box_M) sets the states of the game and sends the actions over the slave box (box_S). We used an Arduino Uno board integrated with an MP3 shield and a Jokebox shield. The Jokebox shield comprises an XBee antenna for communication, a PIR sensor for motion detection, and an arcade pushbutton with an RGB LED strip. Each box shield notifies the other box when it detects movement and the box_M establishes the state of the game (i.e. detect people, play audio file instructions, on going game session, end of game, play audio file with result of game) and sends the action to perform to box_S. The MP3 shield decodes the MP3 files. For example, when the box_M establishes the state "play audio file instructions", the MP3 shield plays the audio file with the instructions "If you want to hear the Joke, press both buttons at the same time". Similarly, the MP3 shield decodes and plays the MP3 files for error, and jokes when it is either a failure or success attempt. The decoded MP3 files are stored in a microSD

card connected to the MP3 shield and played through a portable speaker. Each box weighed less than three kilograms and was powered by Li-Polymer batteries that provided up to five hours of autonomy. This made the Jokebox particularly easy to deploy at diverse locations even if there was no electricity available. The cost of the device was below US $250.

Pilot study

To test whether people could coordinate their actions with the Jokebox, we built a working prototype and informally evaluated it with eight participants (4 female, 4 male) who ranged in age (23 to 50). The device was deployed indoors at a university campus and pairs were invited to play with it for about 10 minutes. We conducted observations and interviews, and analysed the data in a debriefing session. The results were classified in terms of: interaction experience, and design and content issues.

Interaction experience. All participants interacted with the Jokebox at least five times per session even when they had successfully triggered a joke. They communicated with each other to coordinate action, discussed the jokes, and laughed when the interaction was successful. They understood that they needed to press both buttons at the same time (as indicated in the instructions) but half of them didn't understand that the action had to take place while the buttons were blinking.

Design and content issues. Half of the participants associated the red buttons with terms such as "danger" or "emergency" and suggested that they wouldn't press them in a public space. But they thought that the blinking feature was attractive and invited them to interact. Although they considered the audio volume was appropriate for the setting, three of them suggested that the voice recording was "*too fast*". All participants indicated that they liked the laughter at the end of the jokes (e.g. "*It makes you laugh!*"). Six understood that the error noise meant that they had done something wrong. Half of them suggested that it would be more comfortable if the boxes were higher.

Content

To ensure the content delivered by the Jokebox was locally meaningful, we used Facebook to crowdsource jokes (along with a rating from 1 to 5, from "not funny" to "very funny") among members of the community. Three theatre students with local accents were recruited to record the 25 jokes with the highest ratings and the instructions in Spanish.

IN THE WILD STUDY

We conducted an in-the-wild deployment [31] in a city in the Northwest of Mexico. The findings from the initial study were used to inform the design of the Jokebox. Aesthetic changes were made (e.g. blue push buttons) and the threshold for interaction (pressing both buttons) was extended from one to three seconds to allow more time to succeed in triggering a joke. The shape and height of the boxes, and sensors were adjusted to provide a better user experience.

LOCATIONS

We followed a rapid ethnography [23] approach to select where in the public spaces to deploy the Jokebox and evaluate it in situ. Over a two-week period, four observers conducted 18 hours of direct observation at six of the most salient places in the city, on both weekdays and weekends and at different times of the day. We analysed the data at a debriefing session and chose three places based on their potential to attract different types of people, enable diverse activities (playing, waiting, passing by, etc.), and social interactions. The locations were also selected for their pathways and walking areas that offer the potential for "incidental interactions" [1]. The three settings were:

(i) *A Park* - a recreational area that attracts a wide range of individuals, including children, older people, sellers, families and couples that gather to eat, play or walk.
(ii) *A shopping centre* – a bustling place that attracts families, individuals and teenagers who gather in groups.
(iii) *A bus stop* - a quiet place in the entrance of a university campus where students and university staff wait for a bus to go to work or study.

METHOD

Rapid ethnography [23] was again used to evaluate how passers-by interacted with the Jokebox. The device was installed five times at each location during two-hour slots, for a total of ten hours at each place. We recorded each deployment, accounting for a total of 30 hours of footage. During each deployment two observers collected qualitative data in a covert manner, sometimes mixing among participants to hear their conversations and take a closer look as they interacted with the Jokebox. They also made field notes and sketches, and took photos. The same observers were assigned to the same locations throughout the deployments to control for returning interactors. Where possible, observers took notes from informal interviews conducted in situ with participants.

We analysed the video footage using an interaction analysis approach [12]. This method is appropriate to evaluate social interactions in natural environments. Researchers focused on sequences of behaviours and on how other objects and actions in the context affected the interactions [12]. Interesting sequences were transcribed and triangulated using the data provided by the observers.

Deployment

(i) The Revolucion park is a large public green space of about one acre located near the city centre. The park is open to the public all the time but is significantly busier during weekends. It comprises three key areas: the eating area, the playing area, and the main kiosk. The eating area contains communal tables with seating and four food kiosks. The space is mainly occupied by groups and used as a pathway to other areas in the park. While families and groups engage

in conversation as they enjoy their food, individuals who shared a table with strangers often focus on their mobile phones and avoid interacting with others. The playground includes games for children and five communal tables. It attracts families with children and some couples and is considerably louder than the eating area. The kiosk area comprises a large kiosk and a number of benches. This area of the park is often frequented by ice-cream sellers and other pedlars (that are akin to local characters, cf. [26]). Many already know each other, and frequently take breaks and talk to each other.

We placed the Jokebox on a central pathway at the intersection of the playing area and a green area, in front of the kiosk – that would ensure a flow of people encountering it. We collected data (footage and observations) for a total of ten hours over three consecutive weekends both during the morning and the afternoon. We indexed 85 sequences of interactions of which 19 were chains of interactions and 15 occurred as a result of championing provided by individuals and groups. Interactions varied from five seconds to play sessions extending for 20 minutes. Approximately 70% of the users were children, 25% were adults and older adults, and the remainder were teenagers.

(ii) The Macroplaza is a large semi open-air shopping centre. It comprises a variety of shops, a cinema and a food court. While families and individuals walk around the shopping area and the food court, groups of teenagers and other individuals frequently gather in front of the cinema, an area that is mainly used as a meeting point. In front of the cinema are a large flowerbed, two benches and two mall kiosks. People use the flowerbed to wait for others (a comfort space (cf. [9]). This area is particularly busy on Saturdays and Sundays between 6 and 11pm, and average waiting times range from 5 to 15 minutes. While waiting, those who are in groups tend to engage in conversation while those who are by themselves look at their mobile phones.

We deployed the Jokebox next to a lamppost between the entrance to the cinema and the flowerbed (as it was a focal point for groups passing by) for three consecutive weekends from 6 to 11pm. This location was visible to those waiting but people who went from the parking site into the shopping area also transited it. We indexed 69 sequences of interactions: 29 were frugal or incomplete (e.g. pressing one button and leaving), 25 occurred as a result of championing provided by others who had already played or followed from a chain of interactions, and 15 occurred among pairs and groups.

(iii) The bus stop is located at the main entrance of a graduate research centre, which extends through hilly terrain. The space has a semi-circular shape with benches on each side. We chose this bus stop as it provided an opportunity to evaluate the Jokebox in a physically constrained semi-public space where colleagues and strangers wait for the bus to be taken to the on campus. There is only one bus service that comes approximately every 15 to 20 minutes but it is unreliable meaning many have to wait.

We deployed the Jokebox at one of the entrances to the bus stop, and each box was located to one side of the pathway that goes through the semi-circle. We collected data from

Study Location	Affordances of space	Type of visitors	Activities	Micro-level coordination	Macro-level coordination	
					Context	Championing
Park	Outdoor, public space. Jokebox was placed on a pathway at the intersection of a playing area a green area, and a kiosk.	Children, adults (parents, local sellers, passers-by), and teenagers.	Playing, eating, talking, walking by, selling.	Making eye contact and counting to three or shouting. Returning users established new forms of coordination.	Playful environment. Children facilitated chains of interaction. Jokes attracted audiences creating honey-pot effects. Incidental interactions fostered curiosity and engagement.	*Emergent championing* by children and parents. *Opportunistic championing* by local characters: clown, man giving away puppies, sweets seller.
Shopping centre	Outdoor, semi-public space. Jokebox was placed between the entrance to the cinema and a flowerbed.	Groups of teenagers, families with children, and adults.	Walking by, shopping, waiting.	Making eye contact and counting to three.	Competing stimuli caused display deafness (noise, signs and blinking lights). People waiting at comfort places learnt to play through social learning.	*Emergent championing* by groups of teenagers, parents and an adult.
Bus stop	Semi-indoors, semi-public space. Benches on each side and pathway in the middle.	Graduate students, university staff.	Waiting, walking by.	Making eye contact and counting to three.	Quiet waiting space. Incidental interactions created anxiety. Social inhibition due to physical proximity.	*Opportunistic championing* by local character: bus driver

Table 1. Summary of findings from all three sites where the Jokebox was deployed.

observations and footage during ten hours in three consecutive deployments carried out in weekdays (between 9am and 2pm). We indexed 65 sequences of interactions of which 42 were incidental and the remaining 23 were either encouraged by championing or by groups of friends who walked by the bus stop or were waiting for the bus. There were never more than eight people at the bus stop, and for long periods of time there were only one or two individuals waiting.

FINDINGS

The data from each of the three sites were analysed using two broad themes: micro-level and macro-level coordination. This provides a framing for how different aspects of coordination took place. Micro includes the behaviours enacted by users in order to interact with the Jokebox while macro refers to factors associated with the broader context of interaction and the forms of championing carried out by individuals who drew others to play with the device. Table 1 summarises the findings from each of the three locations categorized in terms of the space, types of visitors, activities and the forms of coordination used.

Figure 3. Each thumbnail represents a paired interaction mediated by Jokebox (in yellow squares).

Micro-level coordination

There was a pattern in the fine-grained ways in which people coordinated behaviours to play with the Jokebox in all three settings. To press both buttons at the same time and successfully trigger a joke, 80% of the users would stand by each box in the park, make eye contact and count to three. By enabling eye contact this coordination strategy turned out to be a powerful "ice breaker", allowing people to easily communicate even if they had never talked before. Conversations that began with this coordination often led to more extended ones. The remaining 20%, who were typically children, would either look at the buttons and press them as soon as they started blinking or shout at each other

Figure 4. Chains of interaction enabled by parents and children.

"*now*!" to press them at the same time. Similarly, most people at the shopping centre and the bus stop coordinated their behaviour to press the buttons at the same time by making eye contact and counting to three. This "ice breaking social protocol" was used by some who had started to explain to others how to use the installation by acting like "champions" (see figure 4 and 5). For example, Figure 8 shows how a bus driver explained how the Jokebox worked to a lady waiting there. He convinced her to play with him and guided the interaction by making eye contact with her and counting from one to three.

Macro-level coordination

A more course grain level of analysis was also conducted to examine the effects of context, championing and appropriation of the Jokebox.

Context. In the park, we observed that the interactions with the Jokebox were constant and cheerful. Children were easily drawn to the device and encouraged others to play. Other passers-by approached the Jokebox because they were curious to find out what it was. People approached the interactive space and tried to understand what it was before attempting to use it. In six sequences, these interactions enabled conversation between visitors and resulted in a honeypot effect that attracted others. When curiosity led to active exploration, a chain of interactions based on social learning would begin.

We also observed several instances of 'incidental interactions' in the park. While not all led to direct engagement by those who triggered the sensors, they tended to draw attention from others in the vicinity (see Figure 3). In an average play session, we observed players triggering at least five jokes. This created an opportunity for a small audience to gather around the JokeBox. In all cases people would react to the jokes by looking at each other and laughing when they were perceived as being funny or by mocking those that were "*too silly*".

The shopping centre was a loud environment crowded with displays and luminous signs (cf. [3]) where the Jokebox didn't stand out as much - a phenomenon that might be characterised as *display deafness* (cf. [24]). A large number of individuals walked past and barely noticed it. People were more likely to look at the Jokebox when the buttons were blinking or when others where interacting with it (a honeypot effect, cf. [4]). Although this attracted passers-by, in 80% of the sequences they wouldn't interfere with the

ongoing session, but rather waited for their turn or left. We observed that people behaved differently if they were waiting or just walking by: while the latter were less keen to explore and more likely to leave immediately if they failed to trigger a joke, those who had been waiting at the flowerbed were more likely to spend time watching how others interacted and behave as instructors later (emergent champions, cf. [1]). Over two thirds of the interactions among strangers occurred when there were children involved.

There were two main groups of people who interacted with the Jokebox in the shopping mall: children with their parents who were walking by and teenagers who were waiting in front of the cinema. We observed that as families walked by, children were attracted to the Jokebox. However, parents, who were leading the way, conversing or looking at the shops, typically ignored the installation and prevented the children from interacting by pulling them away as they walked. The second group comprised those who were sitting at the bench looking at the installation and could hear the instructions being triggered by passers-by. However, as the flowerbed provided a comfort space [9] they did not immediately stand up to play with it or only engaged in brief interactions (e.g. 50 seconds).

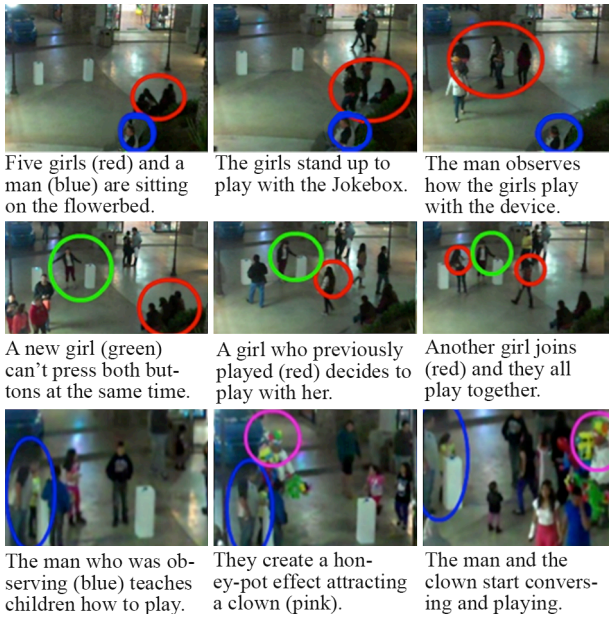

Figure 5. Emergent champions drawing others to interact with the Jokebox at the shopping centre.

There were 16 sequences where people played with the Jokebox following chains of interactions. In such cases they would observe others as they played, learn how the technology worked and give it a try. We identified that laughter, both from interactors and from the audio content, was a driver for engagement and created a honey-pot effect [4]. In these situations people engaged in conversations about the jokes and discussed how they thought the technology worked.

At the bus stop, frequent incidental interactions [1] caused anxiety among those who were waiting for the bus. Because the two boxes were deployed at each side of the pathway, every time someone walked between the devices they triggered the instructions. However, 60% of those walking by were using headsets, chatting with others or on the phone, which meant that they didn't notice the instruction (*display deafness*, cf. [24]). We identified a few individuals who were sitting alone and stood up and left the bus stop, seemingly annoyed by the constant noise.

Furthermore, the number of people available at this site seemed to hinder the number of interactions. For example, in 14 sequences where there were only two people waiting at the bus stop, only one pair interacted with the Jokebox. Nevertheless, we identified that direct interaction with the installation wasn't always necessary to foster shared encounters among strangers. In almost all cases, although pairs did not play with the Jokebox they briefly talked about it. An exemplar sequence is illustrated in Figure 6: a lady was sitting at the bench (A, blue) and when a man stood by the installation an instruction was triggered. They looked at each other and smiled. Five seconds later, she stood up and walked towards the Jokebox. As they spoke, he discovered the other box and pointed it out to her but she was too shy to press it. One minute later she walked away smiling (E). The man sat at the bench and used his mobile phone (F).

Figure 6. An interaction between a lady and a man mediated by the Jokebox at the bus stop.

Championing. Chains of interactions were started through different forms of *emergent* and *opportunistic* championing in all sites. In the park the children, parents and local characters took on the role. Children were easily drawn to the Jokebox and attracted others to play with it by providing instructions, starting game sessions or acting as demonstrators. For example, figure 3 illustrates a typical sequence comprising a pair of children who initiate a chain of interactions and a honey-pot effect. A more explicit type of emergent championing occurred when a boy, who after having played repeatedly with the device, asked passers-by if they wanted to "*hear a joke*". When people accepted he taught

them how to play by positioning himself at one of the boxes and telling them when to press the button on the other box. Other chains of interaction led to group re-assemblages. This meant that new players mixed with others who were already playing, particularly if members of the former group had left. While group assemblages among children who did not know each other seemed to be frequent, this was not the case between children and adults who were strangers.

The ice-cream seller (blue) relocated to the vicinity of the Jokebox (yellow).

He placed his trolley in a salient position visible to those attracted by the device.

He spotted a child (red) and invited him to play with the Jokebox. The child pointed at the device.

The child declined the invitation and walked away. The seller remained by the Jokebox.

Figure 7. Opportunistic championing enacted by the ice-cream seller at the park.

A form of *opportunistic* championing was also carried out by three local characters at the park (cf. [26]): a clown, a man selling ice cream and a man who was giving away puppies (not unusual in Latin America). These characters approached the area where the Jokebox was deployed and found a strategic space to display what they were offering, making them visible to those gathering around it. This ad-hoc appropriation of the interaction space supported their goal of attracting potential customers but also validated their interaction with passers-by. For example, figure 3 shows the ice cream seller standing by his trolley about 8 meters away from the installation. The man looked around and saw children playing with the device. Ten minutes later (in Figure 7) he relocated to the vicinity of the Jokebox, placing himself and his trolley in a salient position by the installation.

These characters championed interactions with the Jokebox in two ways: by providing information about it and by inviting others to use it. The clown even identified one of the observers and offered to become a "compere" demonstrating how to use the device to passers-by. In three sequences children and families approached the man giving away puppies to ask about the Jokebox. He showed them the puppies as he explained how to use it, and they proceeded to play. In other three sequences, the clown and the man selling ice cream also provided information about the device and invited children to play. While informing passers-by was an effective way of fostering interactions, inviting them to play wasn't always effective (figure 7) unless an adult accompanied the children.

At the shopping mall, there were nine chains of interactions fostered by three different emergent champions: a group of girls and a group of boys (aged ≈ 15), and a man. While the first two groups became champions by playing and then voluntarily helped others or instructed them on how to play, the man spent over 20 minutes observing how others interacted before he decided to teach strangers how to use the device. Figure 5 presents a sequence of interactions where emergent championing [26] by a group of girls took place. This led to chains of interactions [29] and honey-pot effects [1] that included an adult, a clown, parents and their children.

The main champion at the bus stop was the bus driver. He was also a local character (cf. [26]) - familiar with the location and who normally spent long periods of time waiting on the bus while people gathered at the station. After driving them through to the different stops at the campus we observed him returning to the main station where the Jokebox was deployed. As a result he became very familiar with the Jokebox, and quickly found ways to integrate it into his routine for his own situated needs. By championing interactions with the Jokebox he had the opportunity to talk and play with those who were waiting, possibly transforming a dull moment into a joyful one. Sometimes he warned people about the jokes not being "*always funny*" and proposed that the Jokebox should deliver "*romantic songs*" to provide a more subtle form of entertainment during "*waiting times*".

Successful interactions tended to lead to chains of interactions as they drew attention from passers-by. For example, as the bus driver interacted with a lady (see figure 8) a passer-by stopped to look at them. The bus driver addressed him to explain: *"This is something to entertain people as they wait for the bus"* and explained how the installation worked. The man then engaged in conversation with them.

Returning users and appropriation. The Jokebox's design supported appropriation, typically by children who were returning users. We observed 14 sequences that included returning users. While most of them played several times during a single deployment, we recognised three children who returned on different days. An interesting aspect of this was that as they became more familiar with the installation they changed the way they interacted with it. For example, a group of girls who had previously used the device established new rules to play, where instead of pressing both buttons at the same time the girls had to take turns to individually run from one box to the other to press both buttons within the three-second threshold. A third group comprising four children split to press the buttons and then reunited around one of the boxes to listen to the joke and comment on it.

The Jokebox design afforded diverse forms of championing and appropriation in the different settings but in each setting the same kinds of micro-coordination were observed. Below, we discuss how the context and design of a public installation can facilitate social interactions that begin with eye contact between strangers and can end with champions appropriating them for their own purposes.

DISCUSSION

The Jokebox successfully enabled the coordination of shared encounters and conversations at two levels. At a micro-level, it was clear *what* to do with the system: pairs followed a sequence of behaviours that started by making eye contact and aimed at synchronising movements to trigger the jokes. This often led to further conversation and even laughter. At a macro-level, there was more flexibility in how the Jokebox was used, that related to different interpretations of *why* the Jokebox was in the context in which it had been deployed: a number of social interactions emerged among audiences that gathered around the installation following a honeypot effect. Social interactions with local characters, or emergent champions, occurred from their deliberate guidance of first time players that gave meaning to the interactions.

Our results suggest that both the micro and macro levels have to be considered carefully in the process of designing urban technologies to foster shared encounters. Below, we propose a number of considerations and implications that are intended to inform the design and deployment of novel interfaces for shared encounters in public places.

Micro-coordination

Eye contact and inter-subjectivity

While most urban technologies have tended to deliver visual content on a display, which responds to the actions of a single user, the Jokebox demanded coordination, enabled eye contact and delivered audio content. The affordances of such a design created a successful ice-breaker, even providing opportunities for participants to establish inter-subjectivity through interaction when trying to figure out if

Figure 8. Championing and micro-coordination enabled by the bus driver.

the other person had found the joke funny or not before reacting to it, either laughing, making gestures of approval or disapproval, and commenting on it.

To support micro-coordination, the technology should allow for interaction in tandem and include features that indicate that coordinated action is required, for example by providing instructions (e.g. increasing the frequency that the lights blink), and using simple, tactile controls that allow people to make eye contact rather than focus on the interface. Using audio rather than visual content can provide opportunities for participants to continue to make eye contact as they interpret the content, which increases the likelihood that conversation will emerge between them [2, 11].

Macro-coordination

Coordination at the macro level was a result of the particular context where the Jokebox was deployed. The intervention enabled a diversity of group interactions, particularly among the audience who gathered around the device and through chains of interactions. As shown in Table 1 the characteristics of the context of the deployment have a major impact on the type of interactions that can emerge around a technology intervention. Researchers seeking to enable shared encounters at public spaces should consider:

The affordances of space: open and public spaces where diverse groups of people congregate [1] seem to be more effective at supporting interactions, particularly when there are places of comfort [9] such as benches, seats and flowerbeds. However, spaces that are more constrained and where small numbers of strangers share physical proximity [22] do not seem to naturally encourage interactions with playful interventions. Moreover, the ambient noise in each site can have an impact on the acceptance of a technology that delivers audio content. Although counter-intuitive, louder environments such as the park and the shopping centre could be augmented through the use of playful audible systems. In contrast, in quieter spaces such as the bus stop

audio content (e.g. loud jokes, sound of laughter) could be disturbing and deter interaction.

The type of visitors: it is important to survey optimal places in a location before deploying a technology to ensure visitors are attracted to it. Diverse crowds visit different places at distinct times and deployments can opportunistically profit from this. For example, while teenagers mostly ignored the Jokebox in the park (possibly because children and their parents were primarily using it) they engaged with it at the shopping centre. We had previously observed that teenagers used this place to congregate every evening, which might have contributed to them feeling ownership over the space and thus enabled engagement with the system (cf. [26]).

The activities: the activities that people carry out in a certain place can determine how successful a situated intervention might be. In shopping centres visitors tend to focus on consumption [3] and the competing stimuli can lead to "display blindness" [24]. However, within the same venue, at places where people meet and sit idle, the intervention can capture more attention.

It is important to consider the context where urban playful technologies *should* be deployed to successfully facilitate shared encounters rather than foster social awkwardness. One strategy might be to use flexible lightweight prototypes that allow them to test features on-the-fly to identify which are more likely to foster pleasant social interactions in each context. Moreover, our findings suggest that micro and macro coordination can be evaluated in the design process at different stages. While a lab-based usability study provides an appropriate setting to investigate how well an interactive system facilitates micro coordination, in situ deployments can reveal whether and how the details of macro coordination manifest themselves in a particular context.

Championing and appropriation

Although the Jokebox was carefully designed to enable micro-coordination, it was open-ended and ambiguous enough to enable ad-hoc appropriation [10] by returning users and local characters. In all three locations, championing was a key driver, fostering further interactions with the Jokebox where the lack of specificity of what it was for enabled people to make their own meaning. O'Hara et al. [26] and Akpan et al. [1] have described how local characters, comperes and emergent champions play a key role in encouraging others to interact with public displays but prior descriptions of how such characters appropriate an installation remain simplistic, and do not provide insight regarding the motivations of champions or how they used the display opportunistically for their own situated purposes. Our study has shown how the situated actions of emergent champions and local characters can also encourage different ways of appropriating the interactive space and drawing others to the interaction. In particular, local characters tended to *opportunistically* champion interactions to support their own needs. The sellers and clowns (study 1 and 2) used the installation to display their products and engage with potential buyers; the man with the puppies found opportunities to show the puppies and try to give them away. The bus driver used the intervention to turn dull waiting into playful interactions with passengers.

Hence, we suggest that appropriation by local characters and emergent champions can be supported by leaving certain aspects of the placement and purpose of the technology open to opportunistic interpretations [10]. Such ambiguity encourages people to make their own explanations and use them to engage others in conversation. Moreover, to provide opportunities for macro-coordination to emerge, the system needs to grab attention (e.g. by using lights, sounds, or enabling curiosity) and deliver rich content (i.e. more than one joke) so people to return to the interactive space. Also, it needs to be deployed in places where people pass-by [1], wait and congregate [4].

CONCLUSION

We have presented the design and evaluation of the Jokebox, a novel lightweight technology that requires two passers-by to come together by coordinating a sequence of behaviours in order to hear a joke. Our findings indicate that the Jokebox is a successful "ice breaker" enabling a wide range of social interactions and conversations among passers-by while respecting their personal space in most contexts. We found that drawing people together through encouraging eye contact, coordination of behaviours and listening to a joke can create shared encounters and enable processes of inter-subjectivity. Additionally, strangers followed these coordination strategies to guide and encourage others to engage with the Jokebox, facilitating a diversity of social interactions. Our study offers new insights into how to design and deploy interactive technologies that can facilitate shared encounters in public places through encouraging strangers to look each other in the eye.

FUTURE WORK

With the goal to deepen our understanding on which and how certain design features may affect social coordination at the micro and macro levels, we are currently conducting a second phase of the Jokebox study. We have developed an even lighter-weight version of the system based on a Wizard of Oz, which allows researchers to control the device's interactive features on-the-fly. In the future we will evaluate the new prototype at different public spaces with the aim to test in situ as many design variables as possible both at the micro level (e.g. type of content and instructions, volume of audio, speed of blinking, cooperation threshold) and macro (e.g. type of visitors, characteristics of the space, context, activities). We hope that these new studies will further contribute to the design of novel and engaging interactive urban technologies aimed to foster shared encounters, eye contact and conversation in public spaces.

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